

Measurements of 3-D Circulation and Particles Dispersion in Skagit Bay from Lagrangian Drifters

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LONG TERM GOALS

The long term scientific objective of this proposal is to study the hydrodynamics of near-shore environments using novel instrumentation and techniques. Special focus is on the spatial structures of the flow that dominate erosion, transport and dispersion processes. We also aim to provide a methodology to test the validity of numerical simulations.

OBJECTIVES

The first objective is to develop an efficient sampling scheme to measure the flow in the shallow estuarine and coastal environments and to provide the partners of the project with three-dimensional circulation data and horizontal dispersion estimates of the particles in the surface flow. This includes gaining operational experience on deploying and recovering an array of RD as well as identifying the optimal set of mission parameters of the RD in different environmental conditions.

The second objective is to measure the flow in the plume of the Tijuana River as well as the circulation in adjacent coastal sea.

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APPROACH

To achieve our first objective we targeted RD deployments during significant rain events at the mouth of the Tijuana River, off La Jolla, and in northern Italy.

To achieve our second objective we coordinated our deployment efforts with other project participants, both from the numerical modeling community and from the observational community.

WORK COMPLETED IN YF'09

Several River Drifters (RD) deployments were made during this past year. Whilst the target was to sample the Tijuana river plume during major rain events, the rarity of the latter hindered our efforts. The table below contains a list of deployments in the San Diego area.

Date	Location	# of RD deployed	duration
12/16/2008	Tijuana river	1	2 hours
01/13/2009	La Jolla	4	2.5 hours
01/14/2009	La Jolla	4	3.5 hours
02/18/2009	Tijuana river	4	2.4 hours

The deployments of 01/13/01/14/2009 were coordinated with the other participants in the project. To gain further operational experience an array of two river drifters was deployed during a storm surge at a river estuary at Lido di Dante (Italy) in April 25-27, 2009.

RESULTS

The main results are:

- 1) RD's operated near the surf zone. We observed that most, if not all, of the rain events were associated with storm conditions (high waves and winds). Small boats were not suitable for operations in such situations and several cancellations occurred. We are now borrowing two jet sky's from the SIO aquarium for our FY '10 operations;
- 2) Several ADCP and bottom pinger sampling schemes were adopted. We concluded that for most applications a 1s sampling (as logged internally by the ADCP module) was appropriate in light of a

more flexible post-processing approach. The RD firmware is now being modified to allow 1s sampling of all the sensors;

- 3) The RD mechanical design was improved: the sails were fitted with zippers, rechargeable batteries implemented, need for extra buoyancy in extremely shallow water assessed, external, add-on, salinity sensors implemented;
- 4) Results of runs made available to numerical modeling community for consistency checks of their numerical simulations (Figure 1)

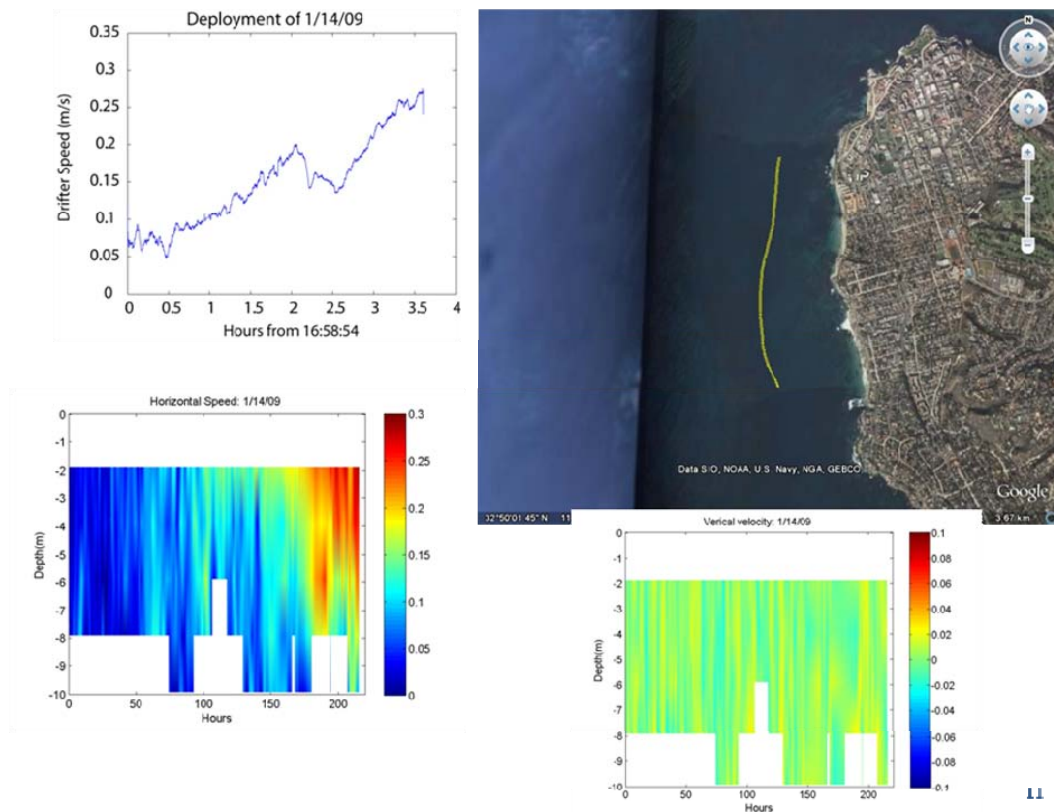


Figure 1: Example of data collected with one RD on January 14, 2009, off La Jolla, California. This run was performed during the acquisition of the boundary conditions for the Deltares model from a variety of sensors.

IMPACT/APPLICATIONS

This research program will investigate ways to operate efficiently multiple arrays of RD and CODE drifters. For the NAVY such methodology is crucial for application of these instruments for both

tactical operations and for testing and initialization of hydrodynamic predictive models of littoral conditions.

TRANSITIONS

None

RELATED PROJECTS

none